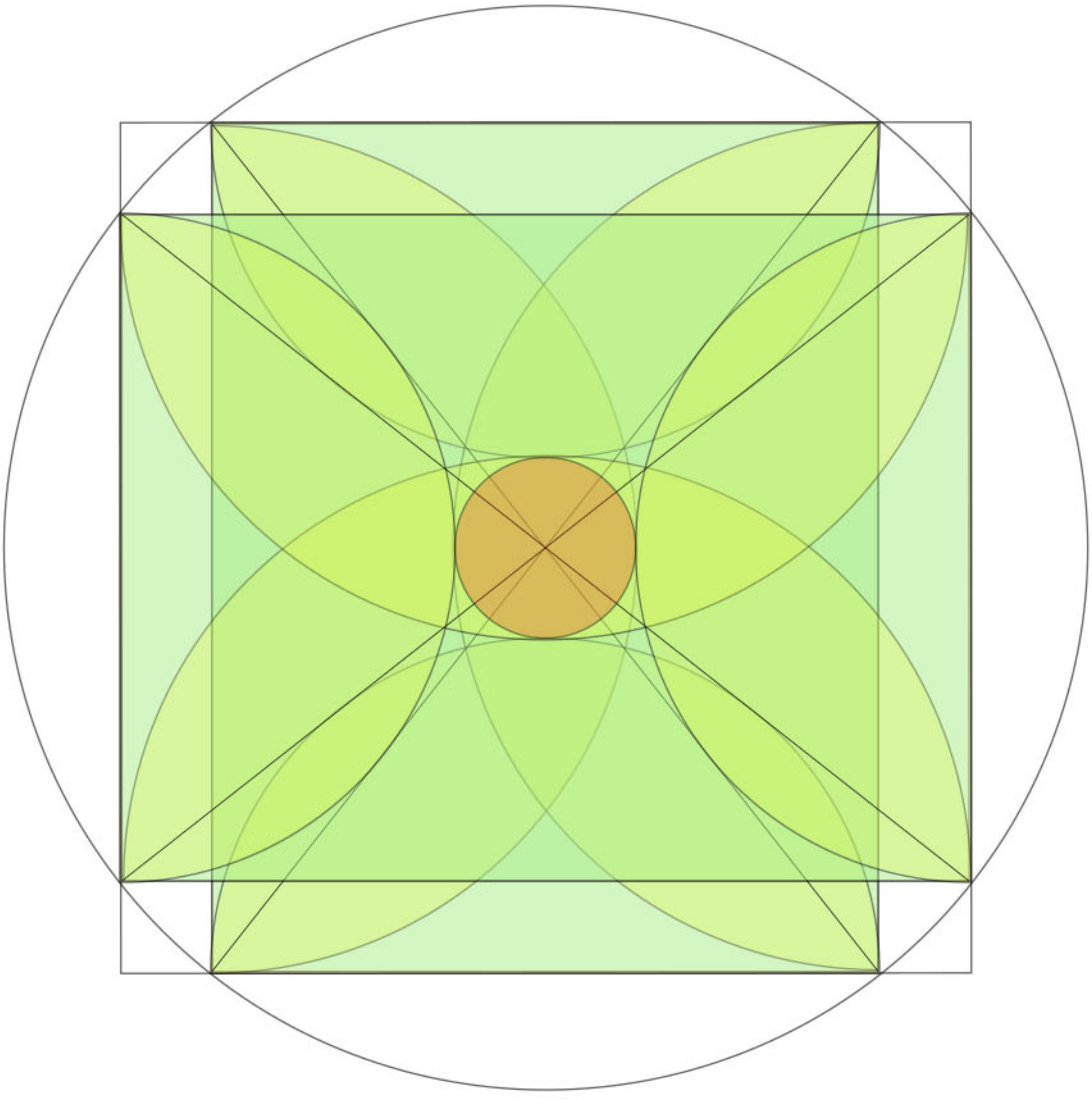
Evidence for Pi

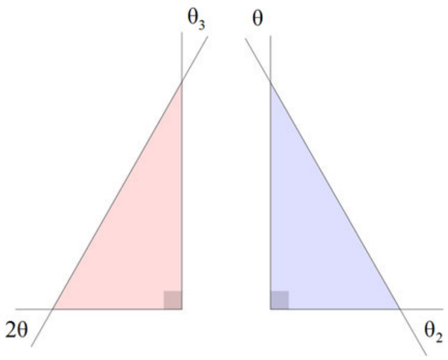
(part 1: Introduction)



Carl Thompson

Introduction

Everything is derived from the angle **theta** as shown in the blue triangle. All triangles are right angled triangles.



$\theta \leqslant 45°$

$\theta_2 = 90° - \theta$

$\theta_3 = \theta_2 - \theta = 90° - 2\theta$

Golden Ratio

$$\Phi = \sqrt{5/4} + 1/2 \qquad 1/\Phi = \sqrt{5/4} - 1/2$$

Trigonometry

For brevity the following substitutions will be used.

$$\cos = \cos(\theta) \qquad \tan = \tan(\theta) \qquad \cos.\tan = \sin(\theta)$$

Equation for a Circle

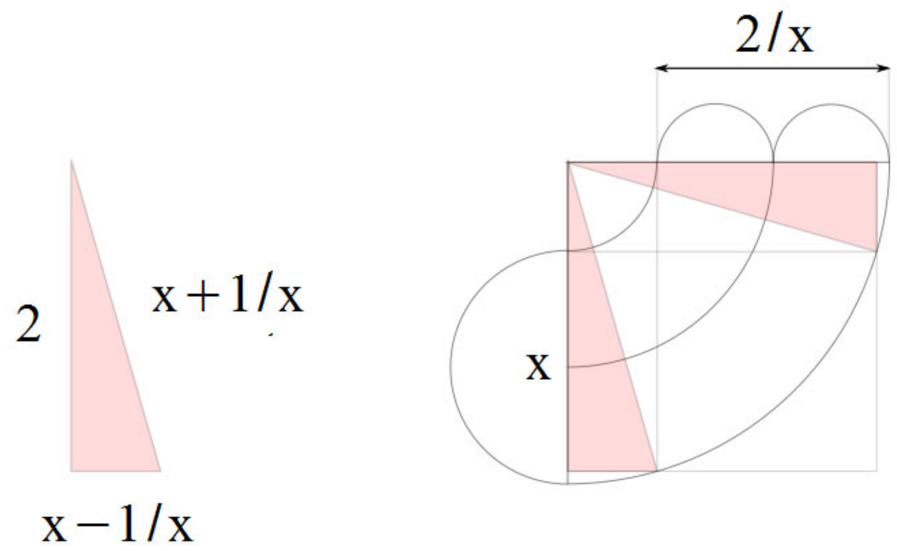
$$1 = \cos^2 + \sin^2$$
$$1 = \cos^2 + (\cos.\tan)^2$$
$$1 = \cos^2(1 + \tan^2)$$

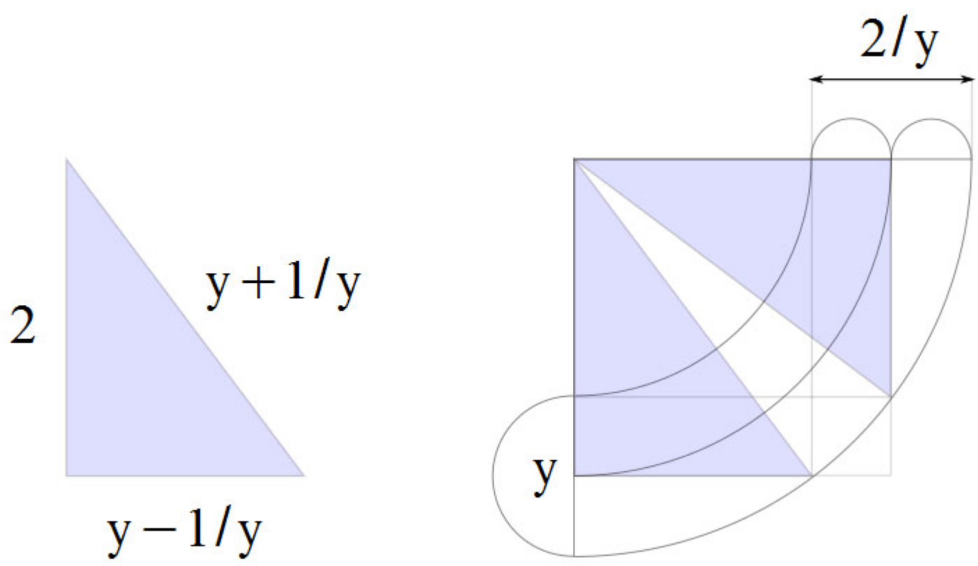
The Cosmic Equation

This cosmic equation works for all right angled triangles.

$$2^2=(x+1/x)^2-(x-1/x)^2$$

It is assumed that (**x ≥ 1**) and that (**1/x ≤ 1**).

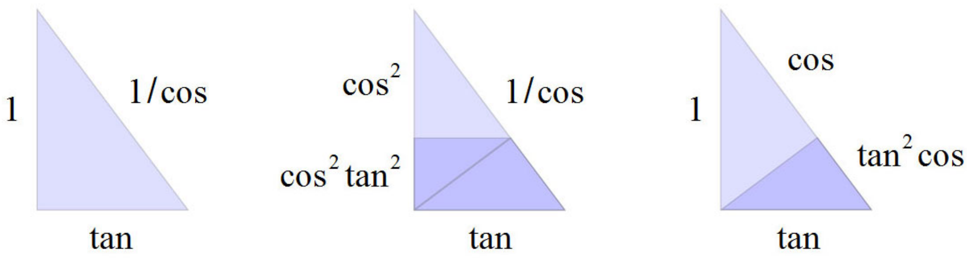




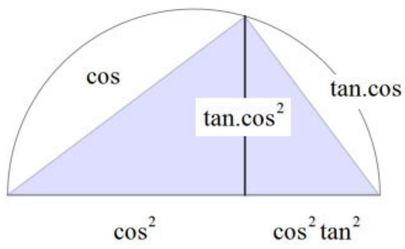
<u>Triangles in Circles</u>

All triangles in circles have the following ratios.

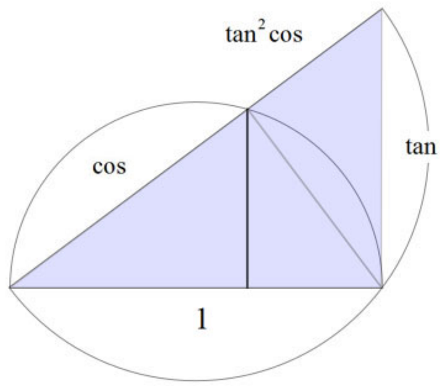
$$1=\cos^2+\cos^2\tan^2 \qquad 1/\cos=\cos+\cos.\tan^2$$



Showing how we can manipulate these triangles.

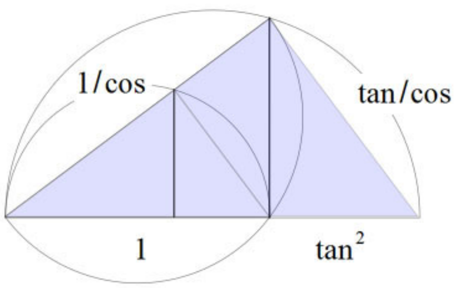


$$1=\cos^2+\cos^2\tan^2$$



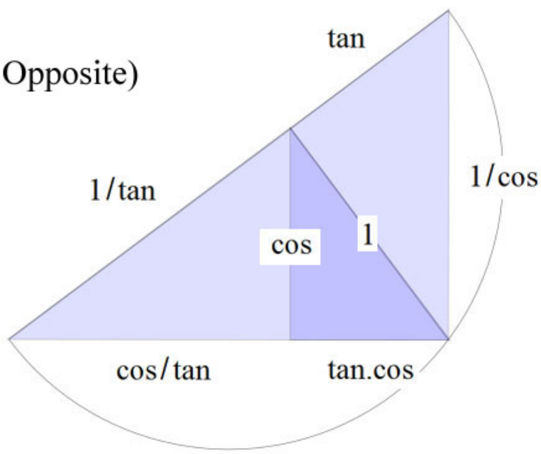
$$1/\cos=\cos+\cos.\tan^2$$

Adjacent)

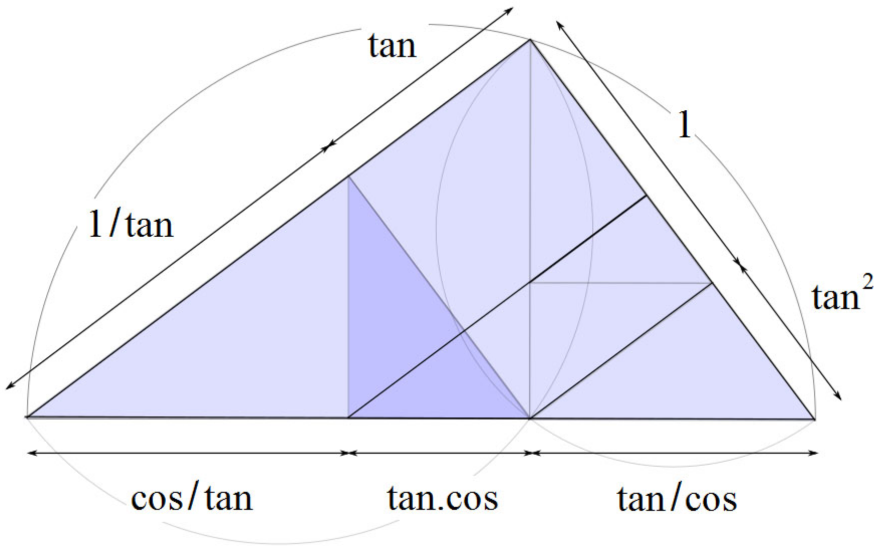


+

Opposite)



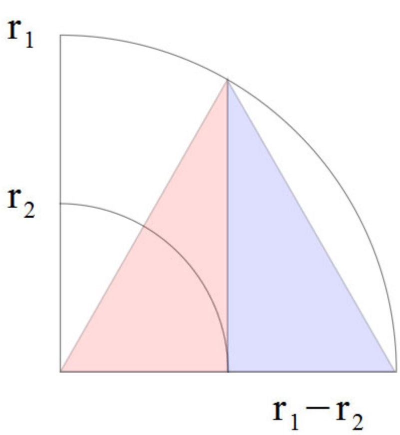
Twist and join triangle (**adjacent**) with triangle (**opposite**), as shown below.

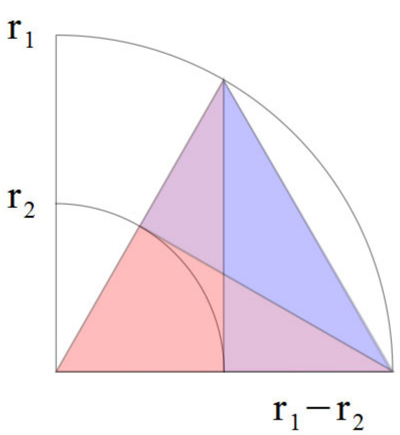


$$1/\tan.\cos = \cos/\tan + \tan.\cos$$

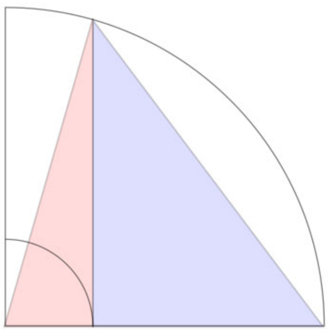
The Red and Blue Triangles

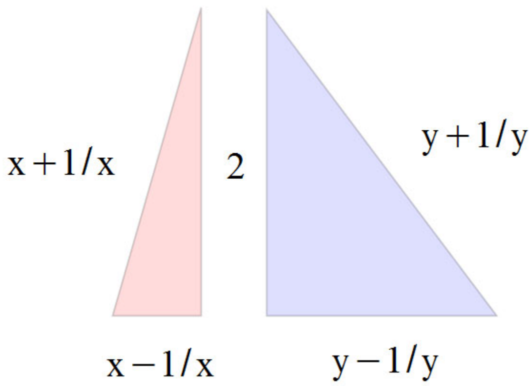
These red and blue triangles fit inside the **radius** of a circle, and have the following symmetry.





The relationship to the 'cosmic' equation, as shown below.



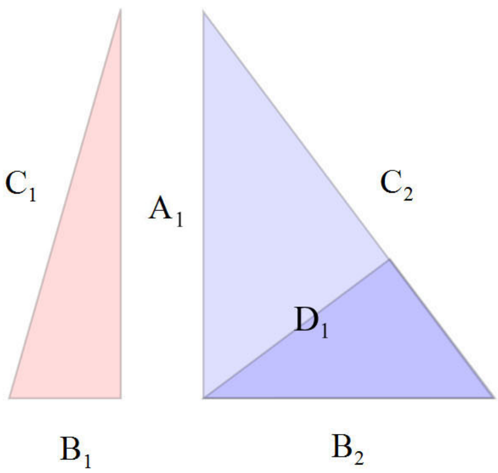


And this is always true.

$$y-1/y=(x+1/x)-(x-1/x)=2/x$$

The link between **x,y** and the trigonometric functions.

$$x=1/\tan \qquad 1/x=\tan$$
$$y=1/\cos+\tan \qquad 1/y=1/\cos-\tan$$



$A_1=(1+\tan.\cos)+(1-\tan.\cos)=2$

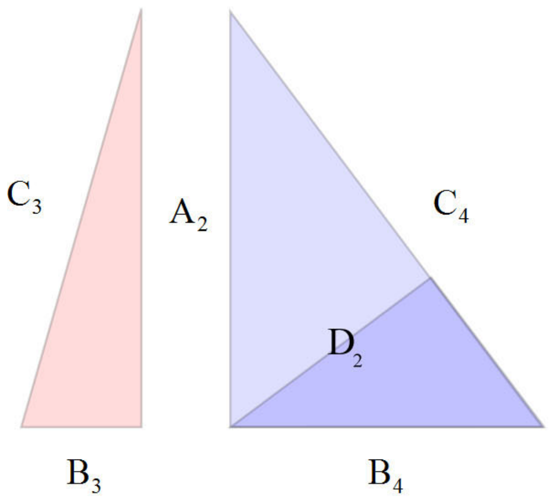
$B_1=1/\tan-\tan$
$C_1=1/\tan+\tan$

$B_2=(1/\cos+\tan)-(1/\cos-\tan)$
$C_2=(1/\cos+\tan)+(1/\cos-\tan)$

$D_1=(1+\tan.\cos)-(1-\tan.\cos)$

Scaling by Circle Radius

Scale triangles with height $\mathbf{A_1}$ by $\mathbf{C_1/2}$ so that $\mathbf{A_2 = C_1}$.



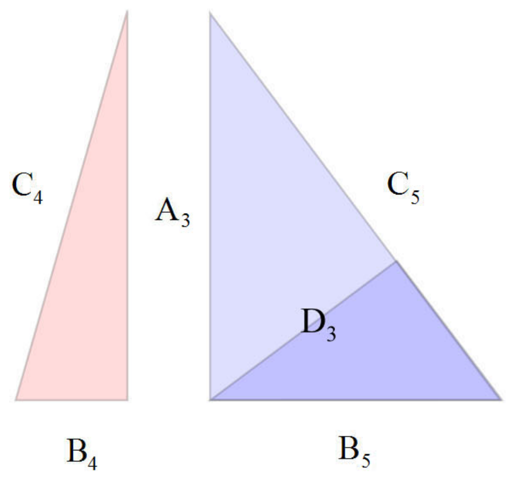
$$A_2 = 1/\tan + \tan$$

$$B_3 = (1/\tan^2 - \tan^2)/2$$
$$C_3 = (1/\tan^2 + \tan^2 + 2)/2$$

$$B_4 = 1 + \tan^2$$
$$C_4 = 1/\cos.\tan + \tan/\cos$$

$$D_2 = \cos(1 + \tan^2)$$

Scale triangles with height $\mathbf{A_1}$ by $\mathbf{B_1/2}$ so that $\mathbf{A_3 = B_1}$.



$$A_3 = 1/\tan - \tan$$

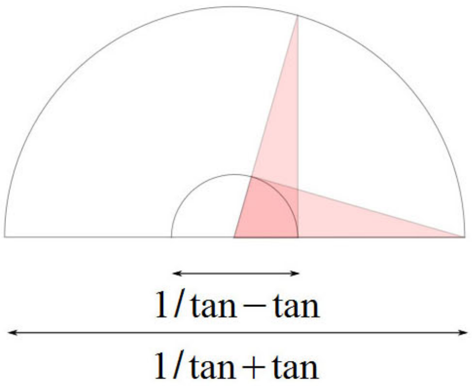
$$B_4 = (1/\tan^2 + \tan^2 - 2)/2$$
$$C_4 = (1/\tan^2 - \tan^2)/2$$

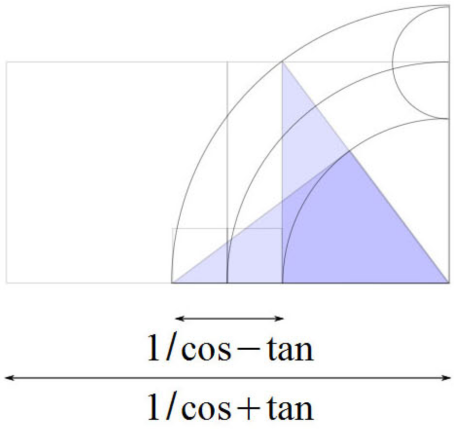
$$B_5 = 1 - \tan^2$$
$$C_5 = 1/\cos.\tan - \tan/\cos$$

$$D_3 = \cos(1 - \tan^2)$$

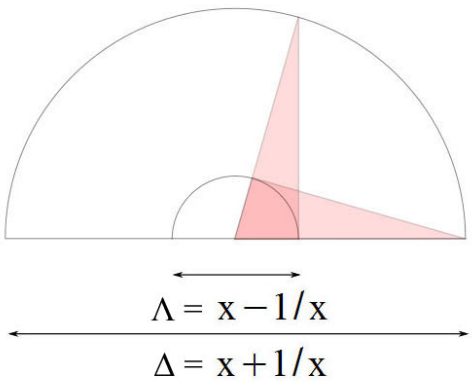
<u>The Circle and Square</u>

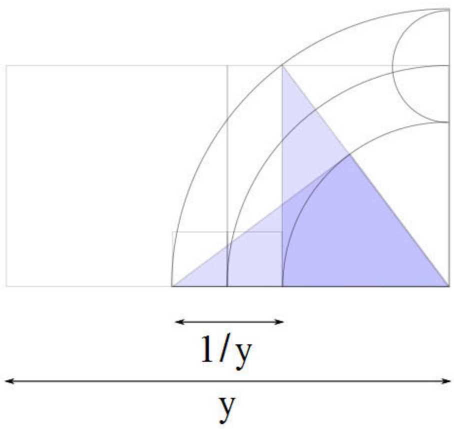
Comparing the circle with the square we find that the terms related to the blue triangles below are always reciprocals.





The terms related to the red triangles are not.



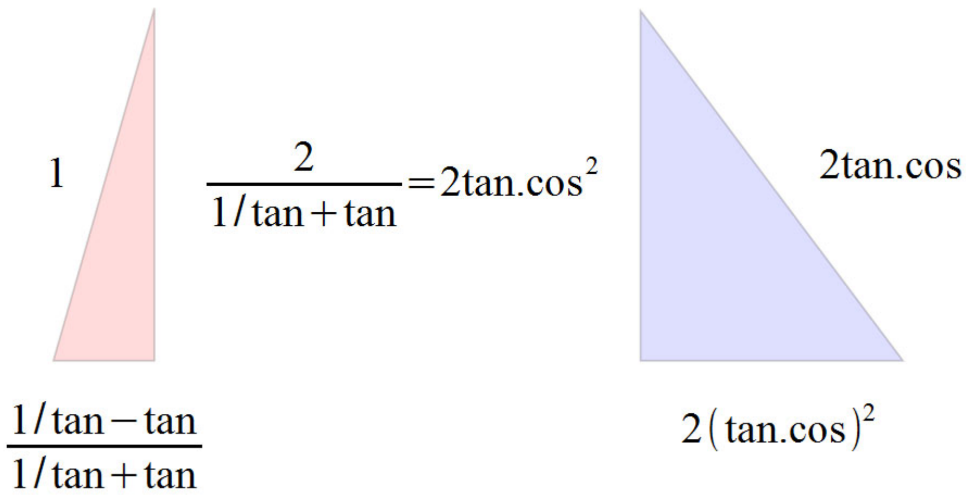


Therefore, we will name these terms **delta** and **lambda**.

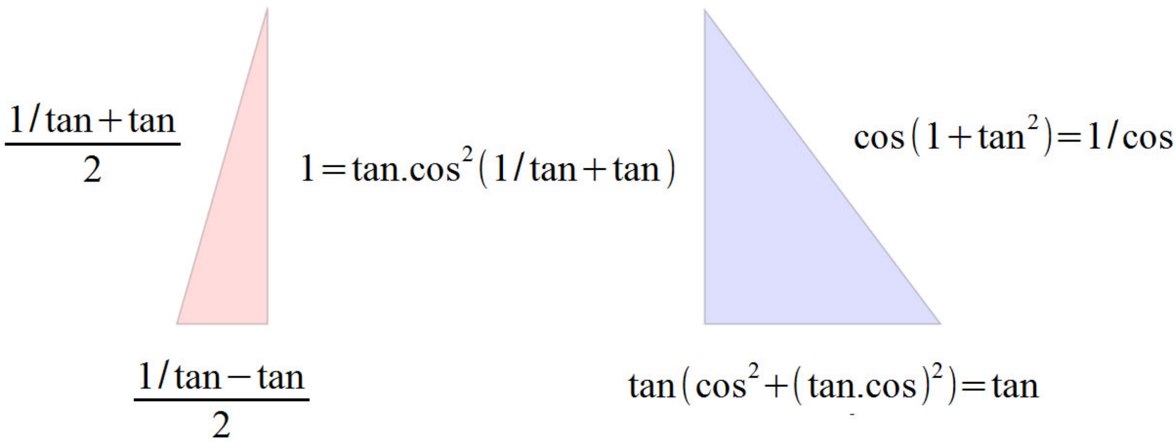
$$\Delta = x + 1/x \qquad \Lambda = x - 1/x$$

Fancy Trigonometry

When the hypotenuse of the red triangle = **1**, its height is equal to **tan(2θ)cos(2θ)** and its base is equal to **cos(2θ)**.



When the height of the red triangle = **1**, its hypotenuse is equal to **1/tan(2θ)cos(2θ)** and its base is equal to **1/tan(2θ)**.



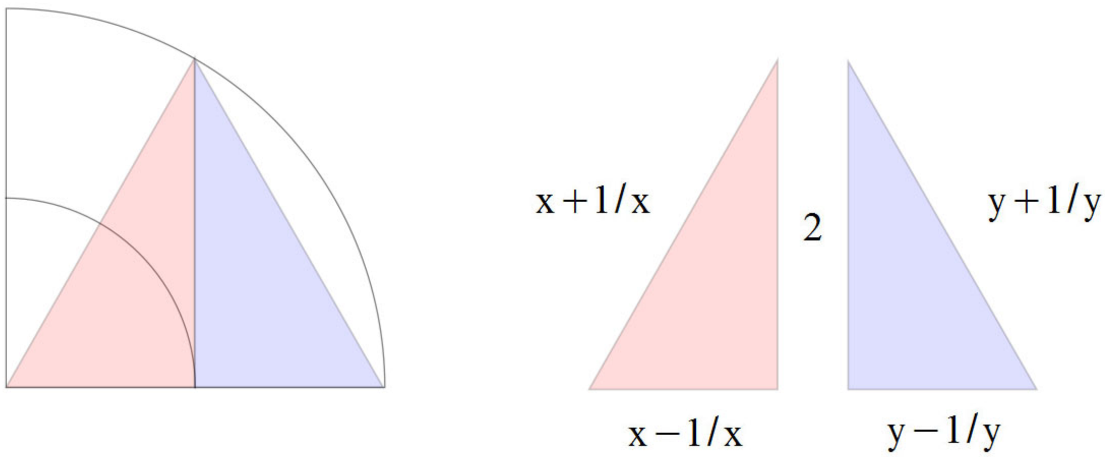
More information.

Examples

A few examples of the things outlined in the introduction.

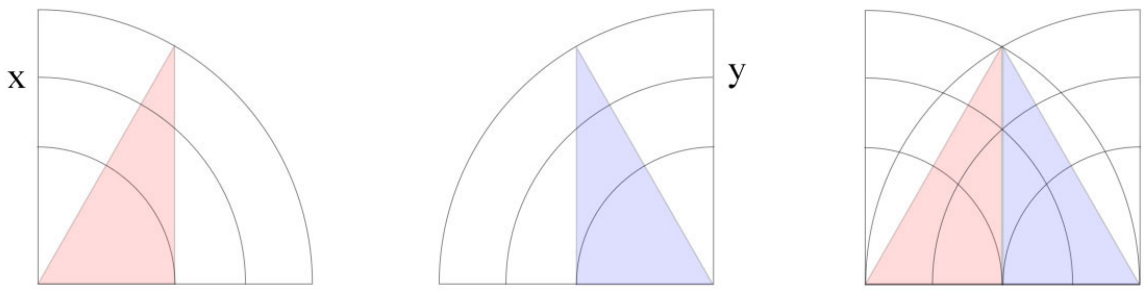
<u>Angle 1</u>

$$\cos=\sqrt{3/4} \quad \tan=\sqrt{1/3} \quad \cos.\tan=1/2$$



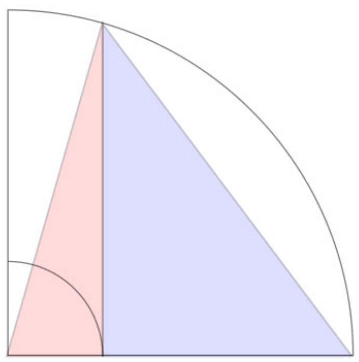
This angle is interesting because **x = y**.

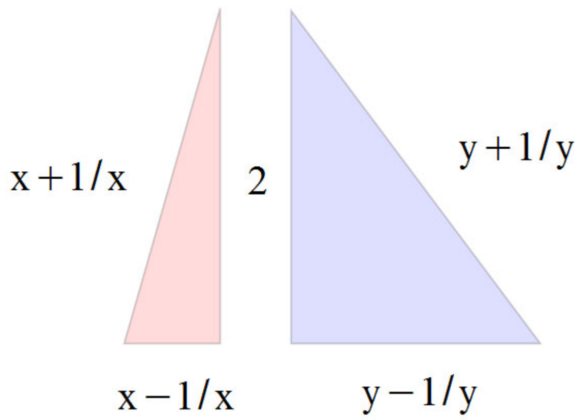
$$\begin{array}{lll} \sqrt{3}\pm\sqrt{1/3} & x=\sqrt{3} & 1/x=\sqrt{1/3} \\ \sqrt{3}\pm\sqrt{1/3} & y=\sqrt{3} & 1/y=\sqrt{1/3} \end{array}$$



<u>Angle 2</u>

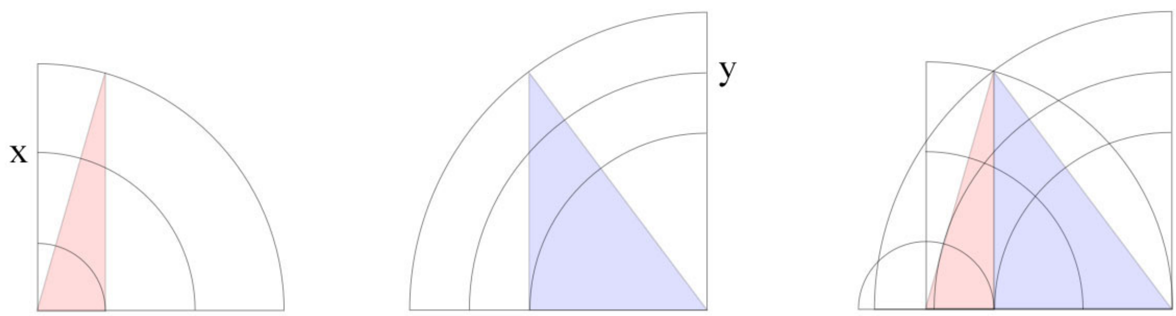
$$\cos = 4/5 \qquad \tan = 3/4 \qquad \cos.\tan = 3/5$$





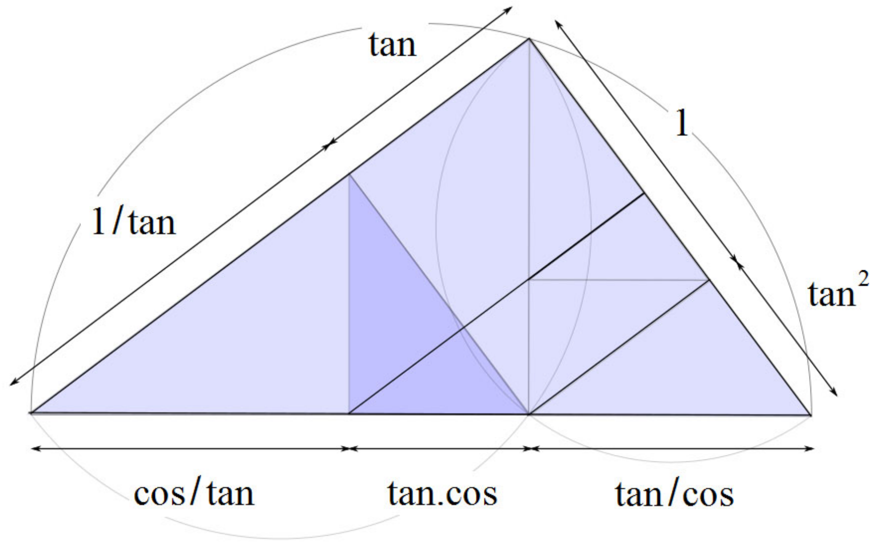
This angle is interesting because of the blue **y** triangle.

$$\sqrt{16/9} \pm \sqrt{9/16} \qquad x = \sqrt{16/9} \qquad 1/x = \sqrt{9/16}$$
$$\sqrt{4} \pm \sqrt{1/4} \qquad y = \sqrt{4} \qquad 1/y = \sqrt{1/4}$$

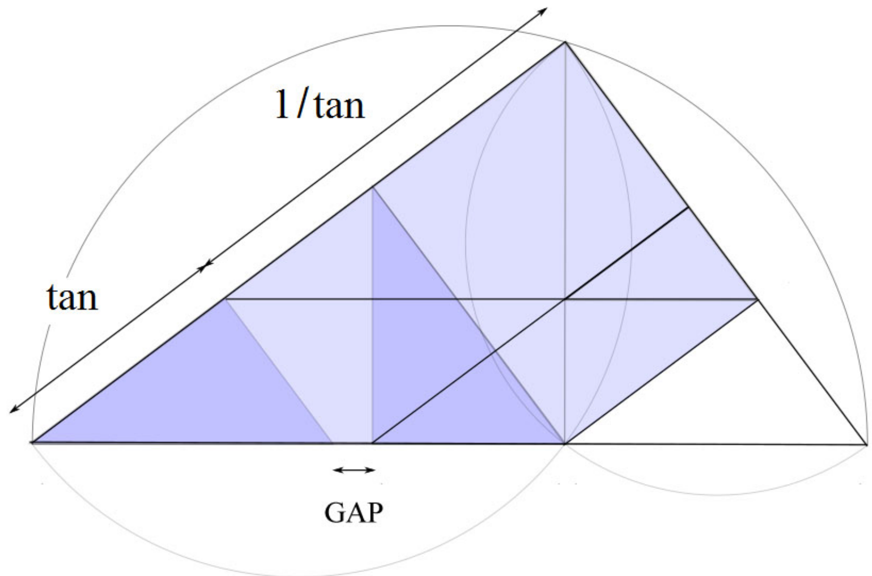


The side lengths of blue **y** triangle have a **345** ratio.

More <u>triangles in circles</u> at this angle.

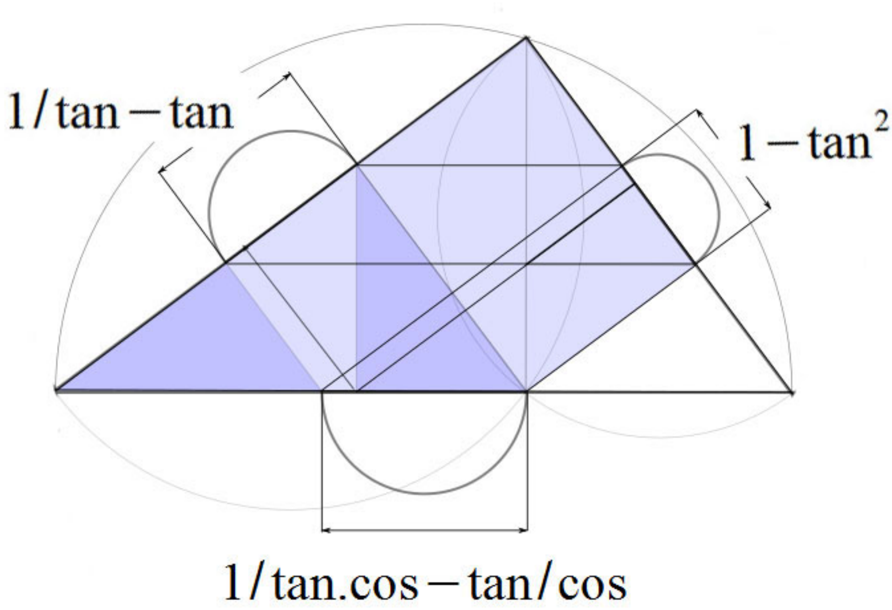


Move the triangle as shown below. Mind the gap.

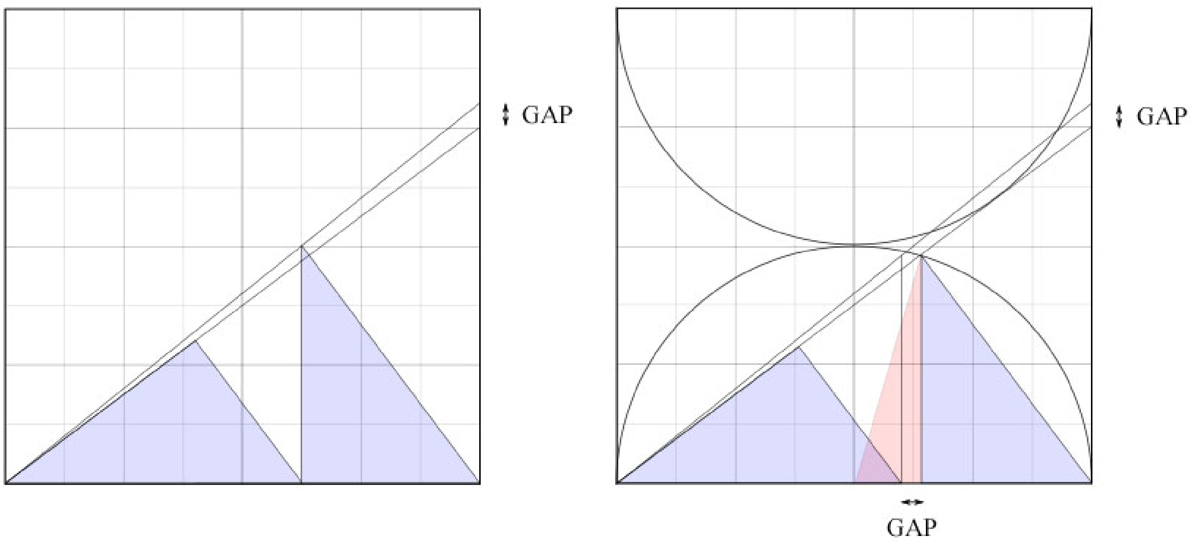


This gap means no more 'fun' with <u>triangles in circles</u>.

This is because the gap has upset the balance between the three circle diameters, as shown below.



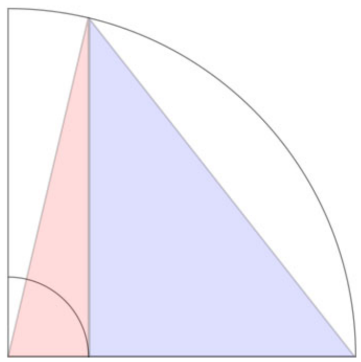
Below we can see how the gap propagates around the geometry of the circle and the square.

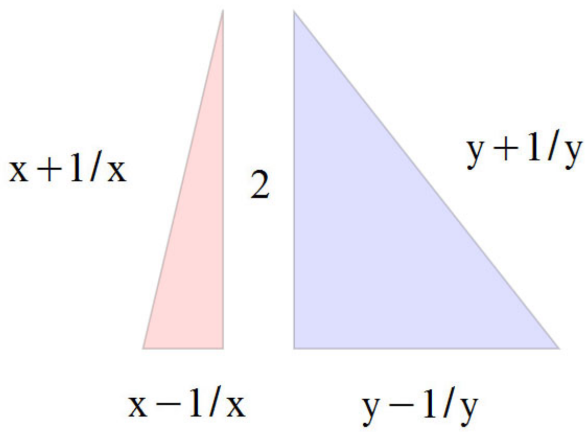


Can we get rid of these pesky gaps.

Angle 3

$$\cos = \tan = \sqrt{\sqrt{5/4} - 1/2} \qquad \cos.\tan = \sqrt{5/4} - 1/2$$

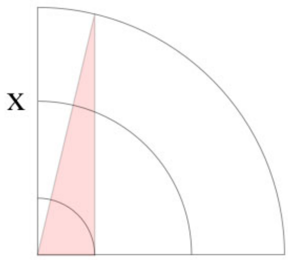


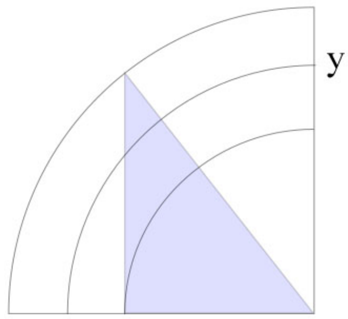


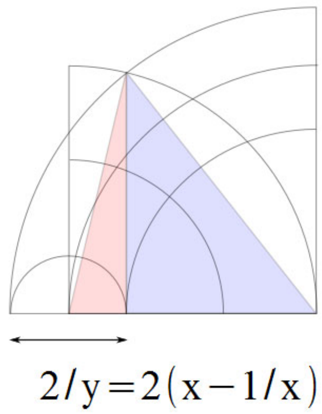
This angle is most interesting.

$$\sqrt{\sqrt{5/4}+1/2} \pm \sqrt{\sqrt{5/4}-1/2} \qquad x = \sqrt{\sqrt{5/4}+1/2} \qquad 1/x = \sqrt{\sqrt{5/4}-1/2}$$

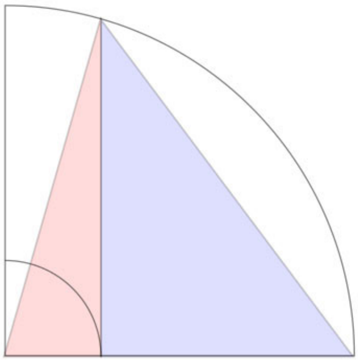
$$\sqrt{\sqrt{5}+2} \pm \sqrt{\sqrt{5}-2} \qquad y = \sqrt{\sqrt{5}+2} \qquad 1/y = \sqrt{\sqrt{5}-2}$$

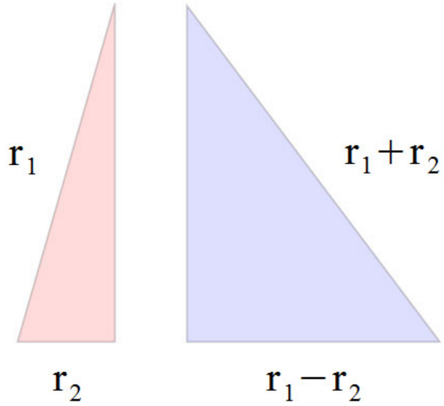






It has the following amazing symmetry, where **r = radius**.

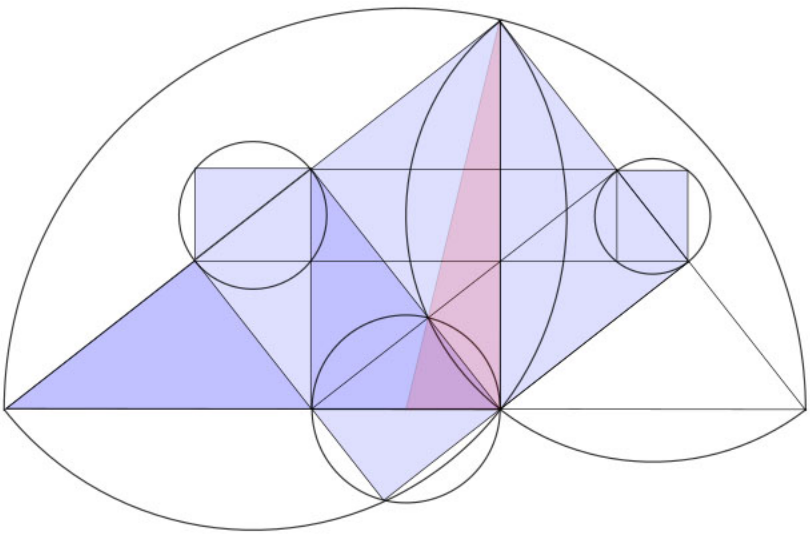




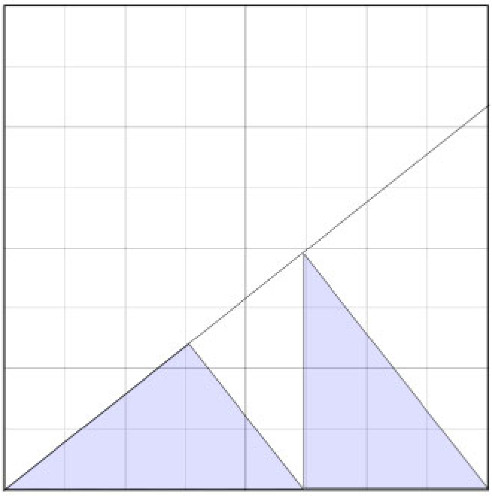
This angle is based on the magical golden ratio (**phi**).

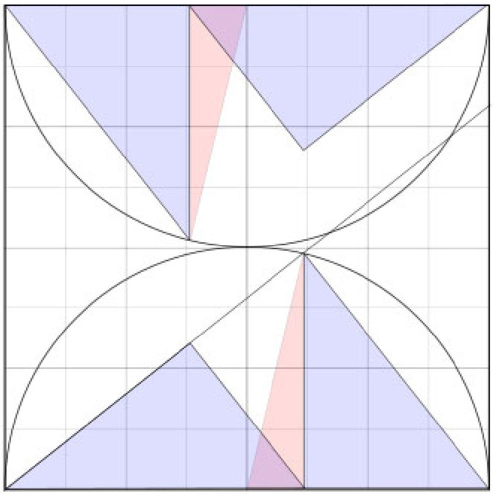
$$(\sqrt{\Phi})\pm(\sqrt{1/\Phi}) \qquad x=\sqrt{\Phi} \qquad 1/x=\sqrt{1/\Phi}$$
$$(\sqrt{\Phi}+\sqrt{1/\Phi})\pm(\sqrt{\Phi}-\sqrt{1/\Phi}) \qquad y=\sqrt{\Phi}+\sqrt{1/\Phi} \qquad 1/y=\sqrt{\Phi}-\sqrt{1/\Phi}$$

And as you can see below, the pesky gap has gone.

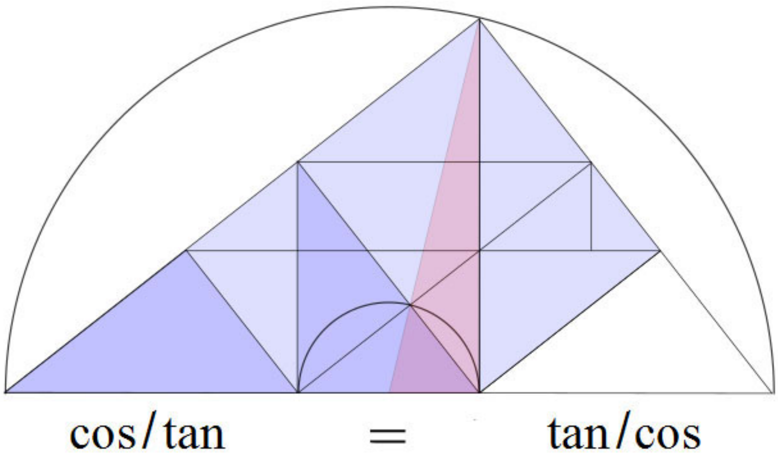


No gap to propagate and ruin the geometry.





This is because at this angle, **cos = tan**. And as you can see below, balance has now been restored.



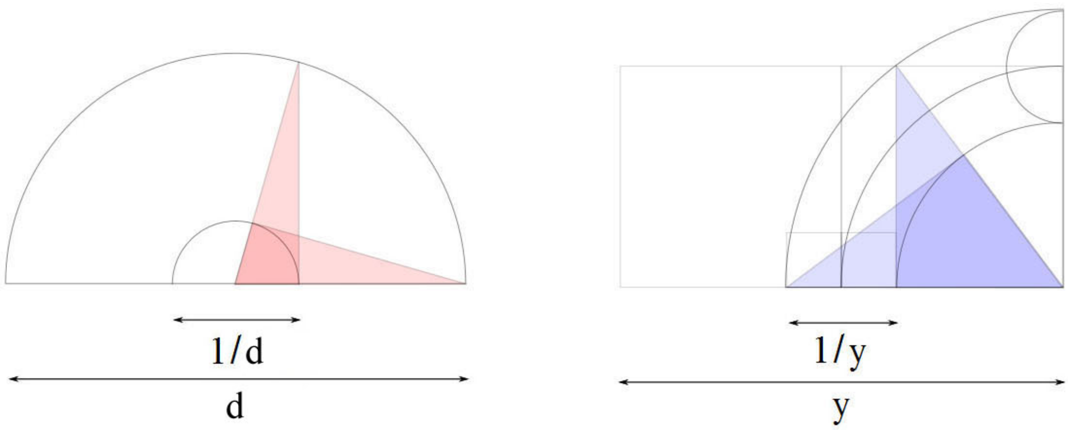
Which means never ending 'fun' with triangles in circles.

At only this angle the following is true.

$$\Delta = (1/\tan + \tan) \qquad \Lambda = (1/\tan - \tan)$$
$$\Delta = 1/\Lambda \qquad \Lambda = 1/\Delta$$

And because these terms are now reciprocals, we can rename them as **d** and **1/d** where **d = diameter**.

Which means we have squared the circle.



Because only this angle preserves the fractal nature of the geometry, or the square numbers as shown below.

$$d(2\sqrt{\cos(2\theta)}) = 2 \qquad \frac{1}{d(2\sqrt{\cos(2\theta)})} = \frac{1}{2}$$

$$d^2(4\cos(2\theta)) = 4 \qquad \frac{1}{d^2(4\cos(2\theta))} = \frac{1}{4}$$

Only possible when **delta** and **lambda** are reciprocals.

Calculator pi is a very 'ugly' number when compared with the perfect symmetry of angle 3 and does not preserve the fractal. Therefore, because of the overwhelming evidence, we will give angle 3 its true name and rename it **pi.**

$$
\begin{array}{lll}
(4/\pi)\pm(\pi/4) & x=4/\pi & 1/x=\pi/4 \\
(4/\pi+\pi/4)\pm(4/\pi-\pi/4) & y=4/\pi+\pi/4 & 1/y=4/\pi-\pi/4
\end{array}
$$

Which means **pi** is based on **phi**, and can be written down as a fraction or even as a fractal.

$$\pi=\sqrt{(16/\pi)^2-16}$$

But don't take my word for it, check it for yourself.

If you need more information or help visualising the symmetry, visit my website and explore my interactive geometry tools and animations.

To be continued...

FOLDING CIRCLES

about.me/foldingcircles

Search #ProofPi to learn about the true value of Pi.

iteration 3.14 (first attempt, not verified, additions and corrections expected)